Electronic Control System

PRECAUTION

Do not open the cover or the case of the ECM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT
Trouble No. 1  No Shifting

1. Warm up engine
   Engine coolant temp.: 80°C (176°F)
   ATF temp.: 50–80°C (122–176°F)

2. Connect a voltmeter to data link connector 1 terminals T_T and E1. Does T_T terminal voltage vary with changes in throttle opening?

   - Yes
   - No

   If Yes, is voltage between ECM terminals STP and E, as follows?
   - 0 V: Brake pedal released
   - 10–14 V: Brake pedal depressed

   3. If No, if brake signal faulty or transmission faulty, then:

   - Yes: Throttle position signal faulty
   - Yes: T_T terminal wire open or short

4. Disconnect solenoid wire connector and road test. Does the transmission operate in the respective gear when in the following positions while driving?
   - D position .... Overdrive
   - 2 position .... 3rd gear
   - L position .... 1st gear

   5. If Yes, continue on page AT–187
Connect solenoid wire connector and road test. Does data link connector 1 T\(_T\) terminal voltage rise from 0 V to 7 V in sequence?  

- Transmission faulty
- Solenoid faulty

0 → 7 V

Proceed to trouble 3 (AT–190)

0 → 3 V 0 → 5 V

Are there 10–14 V between ECM terminals 2–E, when in the D position?

Yes

No

- Park/neutral position switch circuit faulty
- Park/neutral position switch faulty

Try another ECM

Are there 10–14 V between ECM terminals L–E, when in the D position?

No

Yes

Continued from page AT–186
Trouble No.2  Shift point too high or too low

Warm up engine
Engine coolant temp.: 80°C (176°F)
ATF temp.: 50–80°C (122–176°F)

Connect a voltmeter to data link connector 1 terminals Tₜ and EI. Does Tₜ terminal voltage vary with changes in throttle opening?

Yes → Is voltage between ECM terminals STP and E₁ as follows?
0 V: Brake pedal released
10–14 V: Brake pedal depressed

Yes → • Throttle position signal faulty
• Tₜ terminal wire open or short

No → Brake signal faulty

No → Check voltage between ECM terminals P and EI.
Power pattern: 10–14 V
Normal pattern: 0–2 V

OK → • Faulty ECM
• Faulty transmission

NG → Faulty pattern select switch system
Trouble No–3  No up–shift to overdrive (After warm–up)

Road test while shifting manually with solenoid wire connector disconnected. Is there overdrive up–shift in the D position when shifting from L to 2 to D?

- Faulty transmission

Connect solenoid wire connector, and while driving does data link connector 1 T1 terminal voltage rise from 0 V to 7 V in sequence?

- Faulty transmission
- Faulty solenoid

Are there 10–14 V between ECM terminals 2 and E, when in the D position?

- Faulty transmission
- Faulty O/D switch harness
- Faulty O/D switch
- Faulty cruise control ECU
- Faulty park/neutral position switch circuit
- Faulty park/neutral position switch
- Faulty ECM
- Faulty cruise control wire harness
- Faulty transmission

Is voltage between ECM terminals OD2 and E, as follow?
O/D switch turn ON: 10–14V
O/D switch turn OFF: 0 V

- Yes
- No

Is voltage between ECM terminals OD, and E, as follows?
Approx. 5 V

- Yes
- No

Is voltage between ECM terminals OD, and E, as normal with the cruise control ECU connector pulled out?

- Yes
- No
Trouble No.4  No lock-up (After warm-up)

Warm up engine
Engine coolant temp.: 80°C (176°F)
ATF temp.: 50–80°C (122–176°F)

Road test
Connect a voltmeter to data link connector 1 terminals T1 and E1. Is there 7, 5 or 3 V in the lock-up position while driving?

Yes  • Lock-up solenoid stuck
      • Faulty transmission
      • Faulty lock-up mechanism

No  Faulty brake signal

Is voltage between ECM STP and E1 terminals as follows?
Brake pedal depressed: 10–14 V
Brake pedal released: 0 V

Yes  Faulty throttle position signal
INFORMATION OF TT TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL
   (a) Turn the ignition switch to ON. Do not start the engine.
   (b) Connect a voltmeter to data link connector 1 terminals TT and EI.
      (c) While slowly depressing the accelerator pedal, check that TT terminal voltage rises in sequence. If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL
   (a) Depress the accelerator pedal until the TT terminal indicates 8 V.
   (b) Depress the brake pedal and check the voltage reading from the TT terminal.
      Brake pedal depressed .................. 0 V
      Brake pedal released ................... 8 V
      If not as indicated, there is a malfunction in either the stop light switch or circuit.

3. INSPECT EACH UP-SHIFT POSITION
   (a) Warm up the engine.
      **Engine coolant temperature: 80 °C (176 °F)**
   (b) Turn the O/D switch to "ON".
   (e) Place the pattern select switch in "Normal" and the shift lever into the D position.
   (d) During a road test (above 10 km/h or 6 mph) check that voltage at the TT terminal is as indicated below for each up-shift position. If the voltage rises from 0 V to 7 V in the sequence shown, the control system is okay. The chart on the left shows the voltmeter reading and corresponding gears.
      HINT: Determine the gear position by a light shock or change in engine RPM when shifting. The lock-up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2 V–4 V–6 V–7V.
1. INSPECT VOLTAGE OF ECM CONNECTOR
   (a) Remove the cowl side trim of passenger side.
   (b) Turn on the ignition switch.
   (c) Measure the voltage at each terminal.

### INSPECTION OF ELECTRONIC CONTROL COMPONENTS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Measuring condition</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S₁ – E₁</td>
<td>–</td>
<td>10 – 14</td>
</tr>
<tr>
<td>S₂, S₃ – E₁</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>P – E₁</td>
<td>PWR pattern</td>
<td>10 – 14</td>
</tr>
<tr>
<td></td>
<td>NORM pattern</td>
<td>0 – 2</td>
</tr>
<tr>
<td>STP – E₁</td>
<td>Brake pedal is depressed</td>
<td>10 – 14</td>
</tr>
<tr>
<td></td>
<td>Brake pedal is released</td>
<td>0</td>
</tr>
<tr>
<td>THW – E₂(E₂₁)</td>
<td>Engine coolant temp. 80°C (1760°F)</td>
<td>0.1 – 1.0</td>
</tr>
<tr>
<td>IDL – E₂(E₂₁)</td>
<td>Throttle valve fully closed</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Throttle valve open</td>
<td>10 – 14</td>
</tr>
<tr>
<td>VTA – E₂(E₂₁)</td>
<td>Throttle valve fully closed</td>
<td>0.1 – 1.0</td>
</tr>
<tr>
<td></td>
<td>Throttle valve fully open</td>
<td>3 – 5</td>
</tr>
<tr>
<td>VC (VCC) – E₂ (E₂₁)</td>
<td>–</td>
<td>4 – 6</td>
</tr>
<tr>
<td>OD₁ – E₁</td>
<td>–</td>
<td>5</td>
</tr>
<tr>
<td>OD₂ – E₁</td>
<td>O/D main switch turned ON</td>
<td>10 – 14</td>
</tr>
<tr>
<td></td>
<td>O/D main switch turned OFF</td>
<td>0</td>
</tr>
<tr>
<td>SP₁ – E₁</td>
<td>Cruise control main switch OFF</td>
<td>Standing still 0 or 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vehicle moving 2 – 3</td>
</tr>
<tr>
<td>SP₂ – E₁</td>
<td>Standing still</td>
<td>0 or 5</td>
</tr>
<tr>
<td></td>
<td>Vehicle moving</td>
<td>2 – 3</td>
</tr>
</tbody>
</table>
3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No. 1, No. 2 solenoid valves.

Check that the solenoid valves do not leak when low-pressure compressed air is applied.
When supply battery positive voltage to the solenoids, check that the solenoid valves open.

(b) Check the lock-up solenoid valve.

Applying 490 kPa (5 kgf/cm², 71 psi) of compressed air, check that the solenoid valve opens.
When supply battery positive voltage to the solenoid, check that the solenoid valve does not leak the air.

2. INSPECT SOLENOID

(a) Disconnect the connector from the ECM.

(b) Measure the resistance between S1, S2, SL and ground.

Resistance: 11–15Ω

(c) Apply battery voltage to each terminal. Check that an operation noise can be heard from the solenoid.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Measuring condition</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N – E₁</td>
<td>N position</td>
<td>10 – 14</td>
</tr>
<tr>
<td></td>
<td>Except N position</td>
<td>0 – 2</td>
</tr>
<tr>
<td>2 – E₁</td>
<td>2 position</td>
<td>10 – 14</td>
</tr>
<tr>
<td></td>
<td>Except 2 position</td>
<td>0 – 2</td>
</tr>
<tr>
<td>L – E₁</td>
<td>L position</td>
<td>10 – 14</td>
</tr>
<tr>
<td></td>
<td>Except L position</td>
<td>0 – 2</td>
</tr>
<tr>
<td>L₄ – E₁</td>
<td>Transfer shift position H2 or H4</td>
<td>10 – 14</td>
</tr>
<tr>
<td></td>
<td>Transfer shift position L4</td>
<td>0</td>
</tr>
<tr>
<td>B + (+B₁) – E₁</td>
<td>—</td>
<td>10 – 14</td>
</tr>
<tr>
<td>BATT – E₁</td>
<td>—</td>
<td>10 – 14</td>
</tr>
</tbody>
</table>
If a malfunction is found during voltage inspection (step 1.), inspect the components listed below.

4. INSPECT PARK/NEUTRAL POSITION Switch
   (See page AT–203)

5. INSPECT THROTTLE POSITION SENSOR
   Using an ohmmeter, check the resistance between each terminal.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Throttle valve condition</th>
<th>Resistance (kΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDL–E2</td>
<td>Fully closed</td>
<td>Less than 2.3</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Infinity</td>
</tr>
<tr>
<td>VC–E2</td>
<td>—</td>
<td>3.9 – 9.0</td>
</tr>
<tr>
<td>VTA–E2</td>
<td>Fully closed</td>
<td>0.47 – 6.1</td>
</tr>
<tr>
<td></td>
<td>Fully open</td>
<td>3.1 – 12.1</td>
</tr>
</tbody>
</table>

6. INSPECT NO. 2 VEHICLE SPEED SENSOR
   (a) Jack up the rear wheel on one side.
   (b) Connect an ohmmeter between the terminals.
   (e) Spin the wheel and check that the meter needle deflects from OΩ to a0Ω.

7. INSPECT NO. 1 VEHICLE SPEED SENSOR
   (See step 6. on page AT–194)

8. INSPECT PATTERN SELECT SWITCH
   Using an ohmmeter, check the continuity of the terminals for each switch position.

   HINT: As there are diodes inside, be careful of the tester probe polarity.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>4</td>
</tr>
<tr>
<td>NORM</td>
<td>6</td>
</tr>
</tbody>
</table>

9. INSPECT O/D SWITCH
   Using an ohmmeter, check the continuity of the terminals for each switch position.

<table>
<thead>
<tr>
<th>SW position</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>1</td>
</tr>
<tr>
<td>OFF</td>
<td>3</td>
</tr>
</tbody>
</table>

10. INSPECT ENGINE COOLANT TEMPERATURE SENSOR
    (See page FI–115)
11. INSPECT TRANSFER POSITION SWITCH
Check that there is continuity between each terminal as shown.

<table>
<thead>
<tr>
<th>Switch Position</th>
<th>Specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push</td>
<td>Continuity</td>
</tr>
<tr>
<td>Free</td>
<td>No continuity</td>
</tr>
</tbody>
</table>

If operation is not as specified, replace the switch.

12. INSPECT TRANSMISSION FLUID TEMPERATURE SWITCH
Check that there is continuity at the temperature of 145°C–155°C (325°F–343°F).
If continuity is not as specified, replace the switch.